Question 1

Solve, giving your answers in surd form:

$(x - 12)^2 = \dfrac{13}{2}$

Question 2
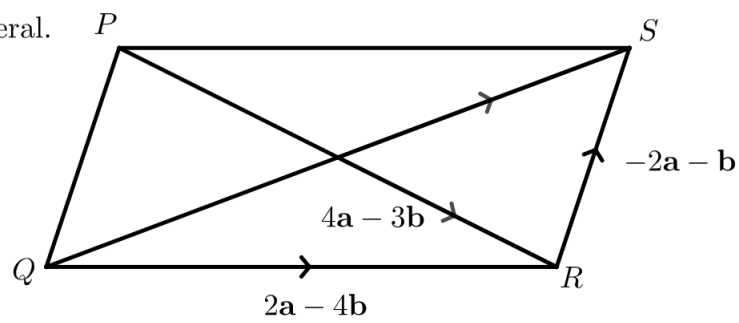
$PQRS$ is a quadrilateral.

$\overrightarrow{QR} = 2\mathbf{a} - 4\mathbf{b}$

$\overrightarrow{RS} = -2\mathbf{a} - \mathbf{b}$

$\overrightarrow{PR} = 4\mathbf{a} - 3\mathbf{b}$

Show that $PQRS$ is a parallelogram.

Question 1

Solve, giving your answers in surd form:

$$(x - 12)^2 = \frac{13}{2}$$

$$x - 12 = \pm \frac{\sqrt{13}}{\sqrt{2}}$$

$$= \pm \frac{\sqrt{26}}{2}$$

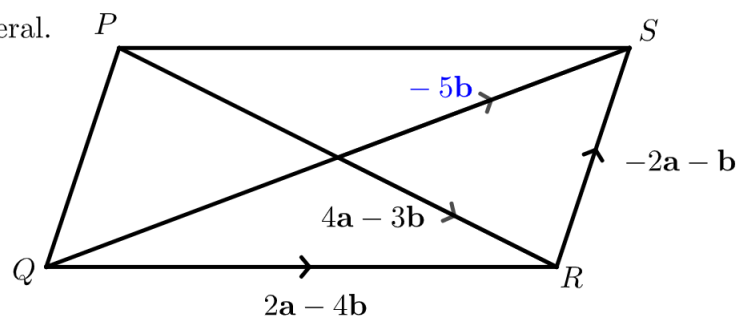$$x = 12 + \frac{\sqrt{26}}{2} \, , \, x = 12 - \frac{\sqrt{26}}{2}$$

Question 2

$PQRS$ is a quadrilateral.

$\overrightarrow{QR} = 2\mathbf{a} - 4\mathbf{b}$

$\overrightarrow{RS} = -2\mathbf{a} - \mathbf{b}$

$\overrightarrow{PR} = 4\mathbf{a} - 3\mathbf{b}$

Show that $PQRS$ is a parallelogram.

First note that $\overrightarrow{QS} = \overrightarrow{QR} + \overrightarrow{RS} = (2\mathbf{a} - 4\mathbf{b}) + (-2\mathbf{a} - \mathbf{b}) = -5\mathbf{b}$

To show that $PQRS$ is a parallelogram, it is sufficient to show that $\overrightarrow{PS} = \overrightarrow{QR}$ and that $\overrightarrow{QP} = \overrightarrow{RS}$:

$\overrightarrow{PS} = \overrightarrow{PR} + \overrightarrow{RS} = (4\mathbf{a} - 3\mathbf{b}) + (-2\mathbf{a} - \mathbf{b}) = 2\mathbf{a} - 4\mathbf{b} = \overrightarrow{QR}$, as required, and

$\overrightarrow{QP} = \overrightarrow{QR} + \overrightarrow{RP} = \overrightarrow{QR} + \left(-\overrightarrow{PR}\right) = (2\mathbf{a} - 4\mathbf{b}) + (-4\mathbf{a} + 3\mathbf{b}) = -2\mathbf{a} - \mathbf{b} = \overrightarrow{RS}$,

as required.